

# First record of two mangrove leaf slugs, *Elysia leucolegnote* and *E. bangtawaensis* (Sacoglossa: Plakobranchidae), in mangrove forests in the Northern Territory

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## Abstract

Here we report for the first time on the occurrence of the distinctive and highly ephemeral sap-sucking sea slugs *Elysia leucolegnote* and *E. bangtawaensis* from mangrove forests from Darwin Harbour, Northern Territory, Australia. Individuals of both species apparently attain smaller body size than their counterparts elsewhere in Australia and the Indo-Pacific region, with maximum extended crawling lengths recorded between 17–22 mm. It appears the northern Australian (i.e. Northern Territory and northern Queensland) populations of *E. bangtawaensis* differ consistently from their counterparts elsewhere in the world in aspects of (parapodial and rhinophoral) colouration.

The ability to retain functioning chloroplasts sequestered from algal host(s) is widespread in the group of sea slugs known as sap-sucking slugs (order Sacoglossa). Numerous species in the genus *Elysia* (family Plakobranchidae, the largest family numerically in the Sacoglossa) are known for their ability to sequester live chloroplasts within their extensively branched digestive diverticula, imparting a bright green colour (e.g. Trench *et al.* 1973; Rumpho *et al.* 2008; Jesus *et al.* 2010). Some of them match their host food precisely (Burn 1998). The genus *Elysia* is species-rich, with some 95 named species (Bouchet & Gofas 2015) and at least that number again undescribed (RCW pers. obs). Its members are mostly small in adult size (< 20 mm) and live on algae in tidal pools, seagrass meadows or in sublittoral algal beds (Swennen 1997). However, four comparatively large (25–50 mm) species are specific to mangrove habitats, aggregating on mud in shaded pools without any apparent algae in the immediate vicinity (Swennen 2011). These mangrove-dwelling species, which have all been described in the last 25 years, are *Elysia leucolegnote*, *E. bangtawaensis*, *E. singaporensis* and *E. bengalensis* (Swennen 2011). Collectively, these four species are commonly called mangrove leaf slugs, as animals resemble a fallen mangrove leaf (in both shape and coloration) when they have their wing-like parapodia relaxed and fully extended (by contrast, all other species of *Elysia* have the parapodia folded up on the dorsal side, with the margins meeting more or less in a wavy line mid-dorsally). All these mangrove leaf slugs are restricted to the

tropical Indo-west Pacific region, but only *E. leucolegnote* and *E. bangtawaensis* occur in both hemispheres, ranging from the western coast of India to the north-eastern coast of Australia (Swennen 1997; Rudman 2007; Rudman 2009; Swennen 2011). Despite the wide distribution and presence of both species in eastern Australia, neither has been previously recorded from anywhere in the Northern Territory.

Here we document the first occurrence of *E. leucolegnote* and *E. bangtawaensis* in Northern Territory mangroves, specifically Darwin Harbour. Like most others throughout the world, the discoveries were of hundreds of individuals, not just one or two. During the early dry season (April) of 2014 approx. 115 adults and juveniles of *E. leucolegnote* were encountered, and during the dry season of the following year (April–May 2015) around 90 adults of *E. bangtawaensis* were encountered.

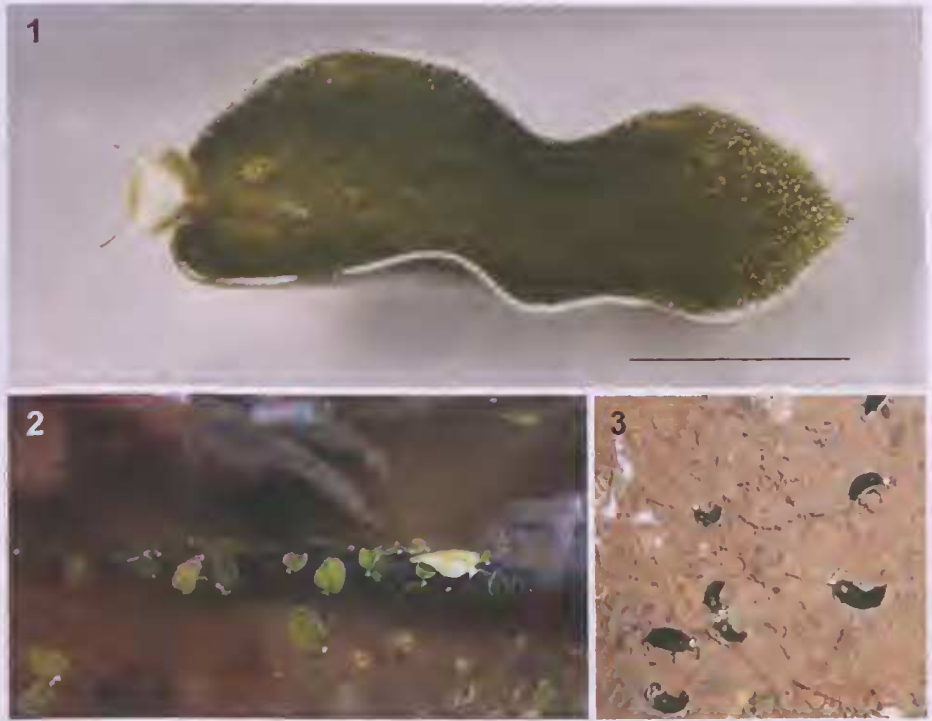
### *Elysia leucolegnote* (Figs 1–3)

On 14 April 2014 approx. 75 adults and juvenile *E. leucolegnote* were found in a puddle in the landward mangrove fringe at Bayview, Sadgroves Creek (12.4419°S, 130.8611°E). These individuals were identified by AJB and confirmed by RCW. *Elysia leucolegnote* is characterised by having a white or yellowish border to the parapodia, a distinctive white triangular mark on the head, and a white line over the dorsal side of each rhinophore that connects with the one from the other rhinophore on top of the head (Swennen 2011) (Fig. 1). All Darwin animals displayed these characteristic features. Living individuals ranged in size from less than 4 mm up to 22 mm in extended crawling length (ECI) and each had a yellowish-green coloured digestive gland (Fig. 2), indicating they had not fed for some months (Swennen 2011). Further specimens were found on 20 April when approx. 40 small (10–15 mm) dark green coloured slugs were recorded in shallow puddles in a low, closed Stilt-root Mangrove (*Rhizophora stylosa*) forest at Virginia, Elizabeth River (12.5690°S, 131.0156°E) (Fig. 3). All the *E. leucolegnote* observed in Darwin mangroves were notably smaller than the maximum size of 41 mm known for this species elsewhere (Swennen 2011).

These records of *Elysia leucolegnote* from Darwin Harbour can be added to those already known for this species from Australia – from northern New South Wales and southern Queensland (Allan 1950; Thompson 1973; Burn 1998). However, it is possible some (if not all) of these records might relate to *E. bangtawaensis* as there are no recent records of *E. leucolegnote* from this region (RCW pers. obs.). Its occurrence in the Kimberley region is to be expected.

### *Elysia bangtawaensis* (Figs 4–7)

*Elysia bangtawaensis* is characterised by the prominent reddish or orange glandular spots along its parapodial margin (Swennen 2011). The description of its colour in life stated “no epidermal pigmentation other than the red and white glands” (Swennen 1998) and noted that the tips of rhinophores were pale-coloured or orange (Swennen 2011). This species was first recorded in the Northern Territory on 21 April 2015, when approx. 20 small (13 mm) individuals were found in shallow, partly shaded puddles amongst

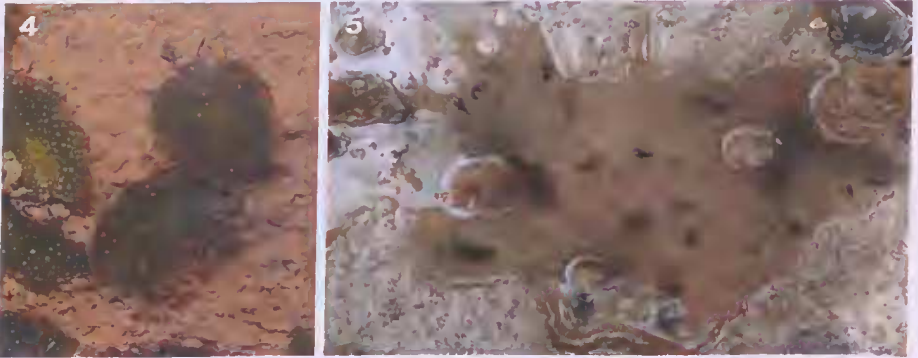


**Figs 1–3.** *Ehsia leucolegnote*. Specimens photographed in the laboratory and *in situ*. 1. An individual with partially relaxed parapodia (scale bar = 5 mm); 2. Yellowish-coloured, starved individuals with fully relaxed parapodia congregated in a shallow puddle near the landward mangrove edge; 3. Dark-green individuals congregated in a shallow puddle (4 mm depth) in a *Rhizophora stylosa* forest. (Adam Bourke)

Pornupan Mangrove (*Sonneratia alba*) pneumatophores in the seaward mangrove community (Fig. 4) about 120 m east of the East Arm Boat Ramp carpark (12.4842°S, 130.9132°E). These individuals were identified by RCW. One month later (i.e. on 20 May) approx. 70 small slugs (9–17 mm) were observed in a similar habitat (Fig. 5) about 240 m west of the East Arm Port Precinct (12.4831°S, 130.9239°E).

These records of *Ehsia bangtawaensis* from Darwin Harbour can be added to those already known for this species from Australia – from northern New South Wales (Cobb 2007, which were also first identified by RCW; Riek 2015), and northern Queensland (Mitchell 2009). As with *Ehsia leucolegnote*, its occurrence in the Kimberley region is to be expected.

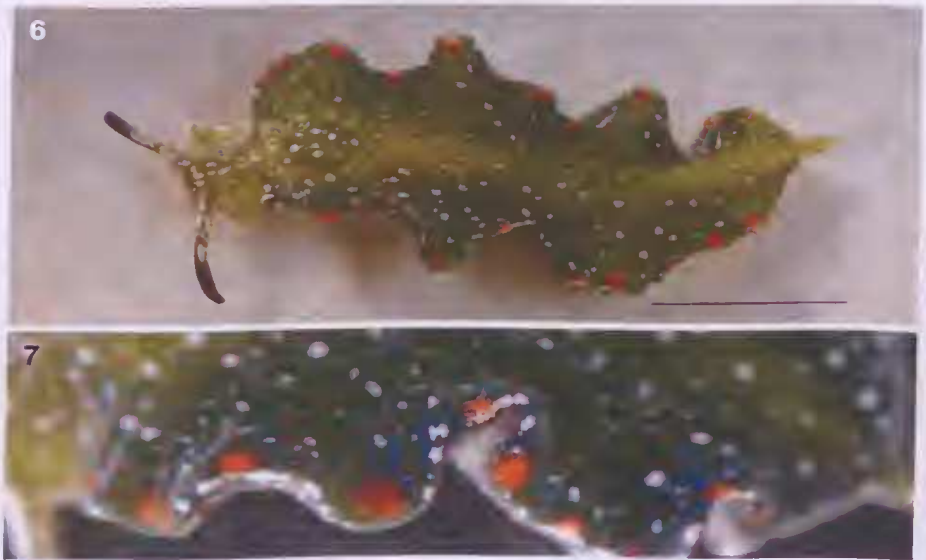
All the *Ehsia bangtawaensis* individuals recorded from Darwin Harbour differed from previously described specimens in having black tips to their rhinophores (Fig. 6) and microscopic, iridescent blue spots covering much of the dorsal and ventral margin of the parapodia (Fig. 7). Interestingly, *E. bangtawaensis* with tiny, metallic blue spots have also been recorded from mangroves in Cairns, northern Queensland (Mitchell 2009).



**Fig. 4.** *Elysia bangtawauensis*. Individuals with relaxed parapodia displaying characteristic leaf-shaped bodies (Adam Bourke). **Fig. 5.** *E. bangtawauensis* aggregated in a shallow puddle in the seaward mangrove community. (Adam Bourke)

However, to our knowledge animals with black-tipped rhinophores have not been reported previously. As is the case with *E. leucolegnote*, all individuals of *E. bangtawauensis* from Darwin Harbour were notably smaller than the maximum live length of 52 mm known for this species (Swennen 2011).

That both of these large species of *Elysia* are highly ephemeral in time and space is shown by the fact that we systematically sampled in mangrove forests in Darwin



**Fig. 6.** A Darwin *E. bangtawauensis* specimen displaying black-tipped rhinophores and characteristic orange glandular dots along the parapodial border (scale bar = 5 mm) (Adam Bourke). **Fig. 7.** Magnified view of *E. bangtawauensis* specimen from Darwin displaying tiny, iridescent blue speckles scattered along the parapodial border. (Adam Bourke)

Harbour for 25 years and never encountered them previously. Therefore, their detection is unlike that of the caddis slug *Aiteng* sp., which remained undetected in the harbour because it is microscopic (Neusser *et al.* 2015).

## Acknowledgements

Sincere thanks to Kees (Cornelis) Swennen for responding to numerous enquiries regarding the distribution and external features of both species. Kristin Metcalfe kindly offered comments on an early draft of this paper

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